

Figure 10.--Calcium concentration

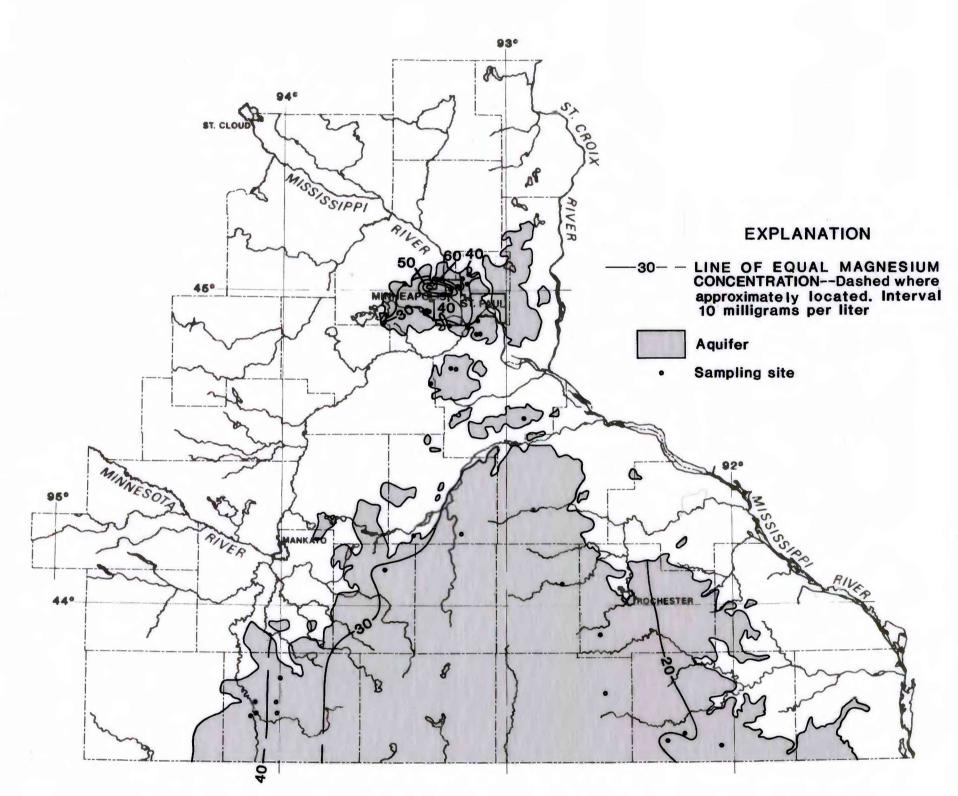


Figure 11.--Magnesium concentration

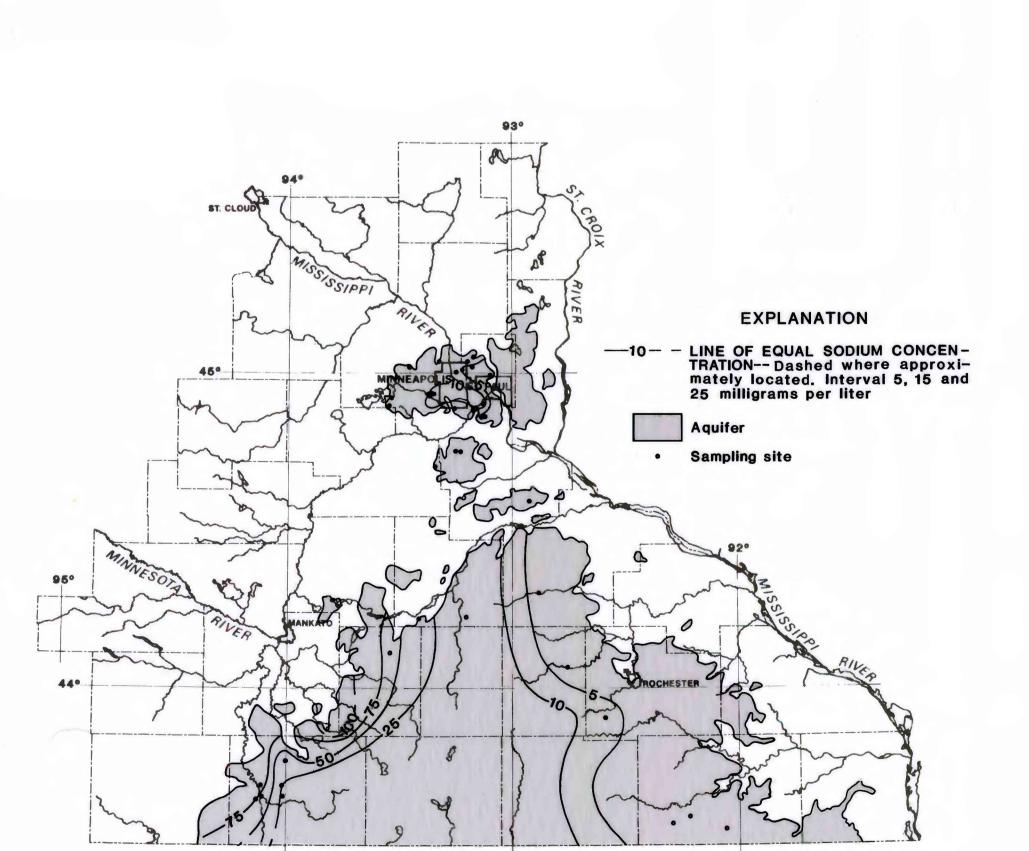


Figure 12.--Sodium concentration

WATER QUALITY

The quality of water in the St. Peter aquifer is generally acceptable for most uses despite some local problems. The mean, median, and range of selected constituents and properties and recommended U.S. Environmental Protection Agency standards for public supply are given in table 2. Data used in the preparation of this table and figures 8 through 14, which show the areal distribution of dissolved solids and major ions, are from the U.S. Geological Survey Water Data Storage and Retrieval System (WATSTORE), from the Storage and Retrieval System (STORET) maintained by the U.S. Environmental Protection Agency, and from U.S. Geological Survey Hydrologic Atlases. Virtually all the data were collected during 1960-

Table 2.--Summary of representative water-quality analyses of water from the aquifer

umho/cm, micromhos per centimeter; µg/L, microgram per liter

Values are given in milligrams per liter except as indicated.

Constituent or property	maximum or range for pub-		and the			
	lic supply1/	analyses	Mean	Median	Minimum	Maximu
Specific conductance						
(µmhos/cm at 25oC)		35	771	572	370	3100
рН	. 6.5-8.5	34	7.6	7.6	7.1	8.
Temperature, water						
(°C)		33	11.0	11.0	9.0	20.0
Hardness as CaCO3						
(Mg, Ca)		29	320	300	190	610
Noncarbonate hardness		25	34	5	<1	270
Calcium, dissolved						
(Ca)		27	79	77	45	160
Magnesium, dissolved						
(Mg)		29	29	27	14	50
Sodium, dissolved (Na).		29	13	5.2	1.4	73
Sodium percentage		29	6	3	<1	22
Potassium, dissolved						
(K)		29	3	2	.6	9
Bicarbonate (HCO2)		32	370	350	210	610
Carbonate (CO3)		20	<1	<1	<1	<1
Sulfate, dissolved						
(SO _h)	. 250	29	50	12	2	410
Chloride, dissolved						
(C1)	. 250	29	6.7	1.7	<.1	110
Fluoride, dissolved						
(F)		29	•3	.2	.2	•7
Silica, dissolved						
(S10 ₂)		29	18	18	8.2	34
Dissolved solids (res-		-,				-
idue on evaporation						
at 180°C)	. 500	26	384	348	194	957
Nitrate, dissolved	. , ,		50.	3.0		
as N	. 10	13	.3	6 .14	<.01	1.4
Boron, dissolved as B,		.5	.,	• • • • • • • • • • • • • • • • • • • •		
µg/L		26	20	<10	<10	90
Iron, dissolved as Fe,						
дg/L	. 300	3	2200	2400	420	3700
Manganese, total as	. 500	3				5,00
Mn, µg/L	. 50	28	190	80	<1	540
тт, же, ш	. 50		1 30	00		3 10

Dissolved Solids

Dissolved-solids concentration, which is weight of substances dissolved in a given volume of water, is a commonly used guideline to indicate suitability of the water for various uses. The recommended maximum for dissolved-solids concentration proposed by the U.S. Environmental Protection Agency (1977) for drinking water is 500 mg/L. Water with less than 500 mg/L dissolved solids generally is satisfactory for most domestic and industrial uses.

Dissolved-solids concentration in the St. Peter aquifer ranges from 194 to 957 mg/L (table 2). The highest concentration is in the extreme southwest part of the aquifer where highly mineralized leakage from overlying Cretaceous deposits influences water quality (fig. 8).

GROUND-WATER QUALITY

Ground water is commonly classified on the basis of relative concentrations of major cations and anions. Water from the St. Peter aquifer is predominantly of the calcium magnesium bicarbonate type, as shown by the water-type patterns in figure 8. This type of water is common in recharge areas and throughout most of the upper part of the ground-water system (Winter, 1974). Calcium sulfate water predominates in the southwestern part of the aquifer as a result of highly mineralized leakage from overlying Cretaceous deposits (fig.

Water Types and Major Ions

Concentrations of sodium, magnesium, and sulfate generally increase to the west, and those of calcium, bicarbonate, and chloride generally increase toward the margins of the aquifer (figs. 9-14). Cretaceous deposits in the southwest are a source of sulfate. The quality of water in parts of the aquifer in the Twin Cities basin that are laterally discontinuous compares closely with the rest of the aquifer, except for chloride, which is higher.

Water-Quality Problems

Shale layers in the Decorah-Platteville-Glenwood confining bed protect most of the St. Peter aquifer from surface contamination. The potential for contamination increases where the aquifer underlies thin deposits of saturated drift, which has relatively high vertical permeability. Figure 6 shows areas where drift overlying the St. Peter aquifer is less than 50 feet thick. Faults and fractures in overlying confining layers, and buried valleys that intersect the aquifer, may contribute to contamination from surface sources. Multiaquifer wells and deteriorated or improperly grouted well casings provide additional passageways for contaminants to enter the aquifer.

The most notable contamination has occurred in a suburb of Minneapolis where toxic organic compounds were identified in water samples collected from wells in the St. Peter aquifer. The source of this contamination is a coal-tar distillation plant that operated for 55 years until 1972 (Hult and Schoenberg, 1984). Elsewhere in the State, high concentrations of iron, hardness, and sulfate, particularly in the southwest, limit use of the water for municipal and industrial purposes (Anderson and others, 1974a; 1974b).

CONVERSION FACTORS

Multiply inch-pound unit	By	To obtain SI (metric) unit	
foot (ft)	0.3048	meter (m)	
gallon (gal)	3.785	liter (L)	
gallon per minute (gal/min)	0.06309	liter per second (L/s)	
square mile (mi ²)	2.590	square kilometer (km²)	
micromho per centimeter (µmho/cm at 25°C)	1.000	microsiemens per centimeter (us/cm at 25°C)	

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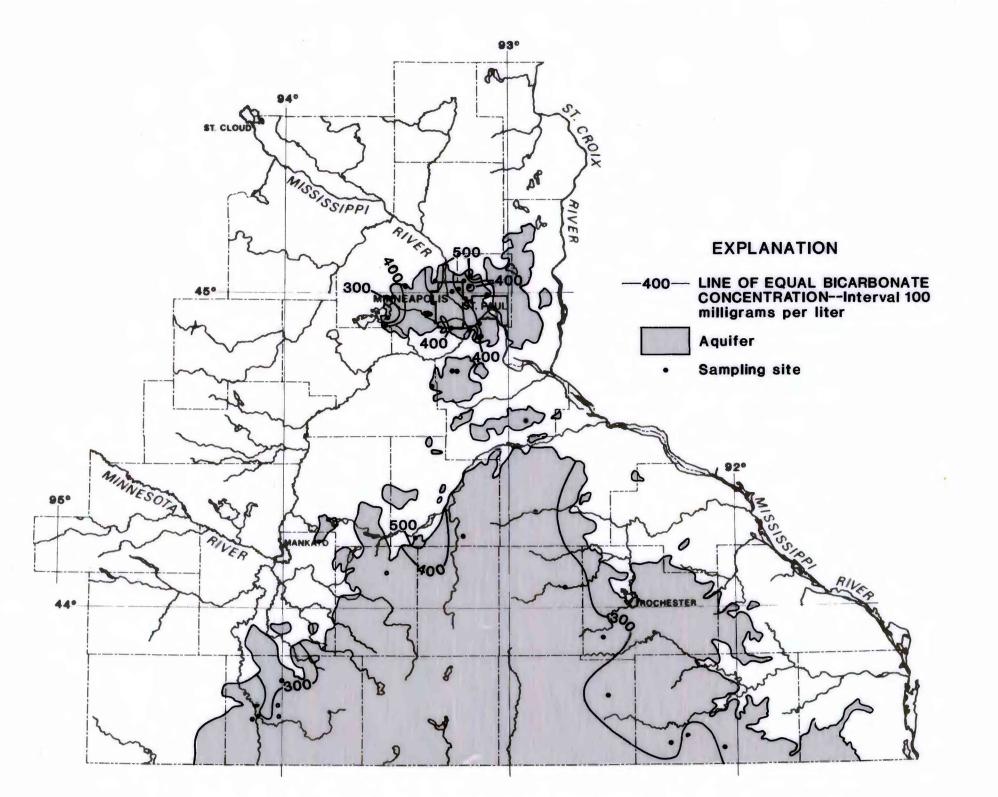


Figure 13.--Bicarbonate concentration

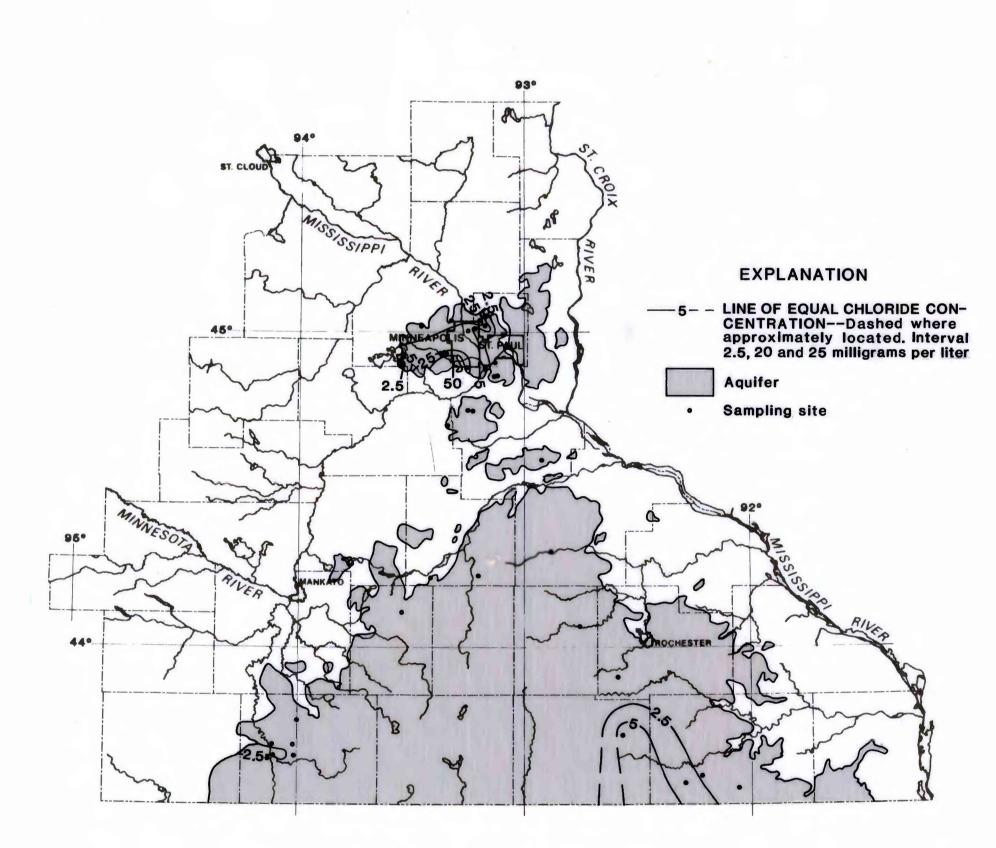


Figure 14.--Chloride concentration

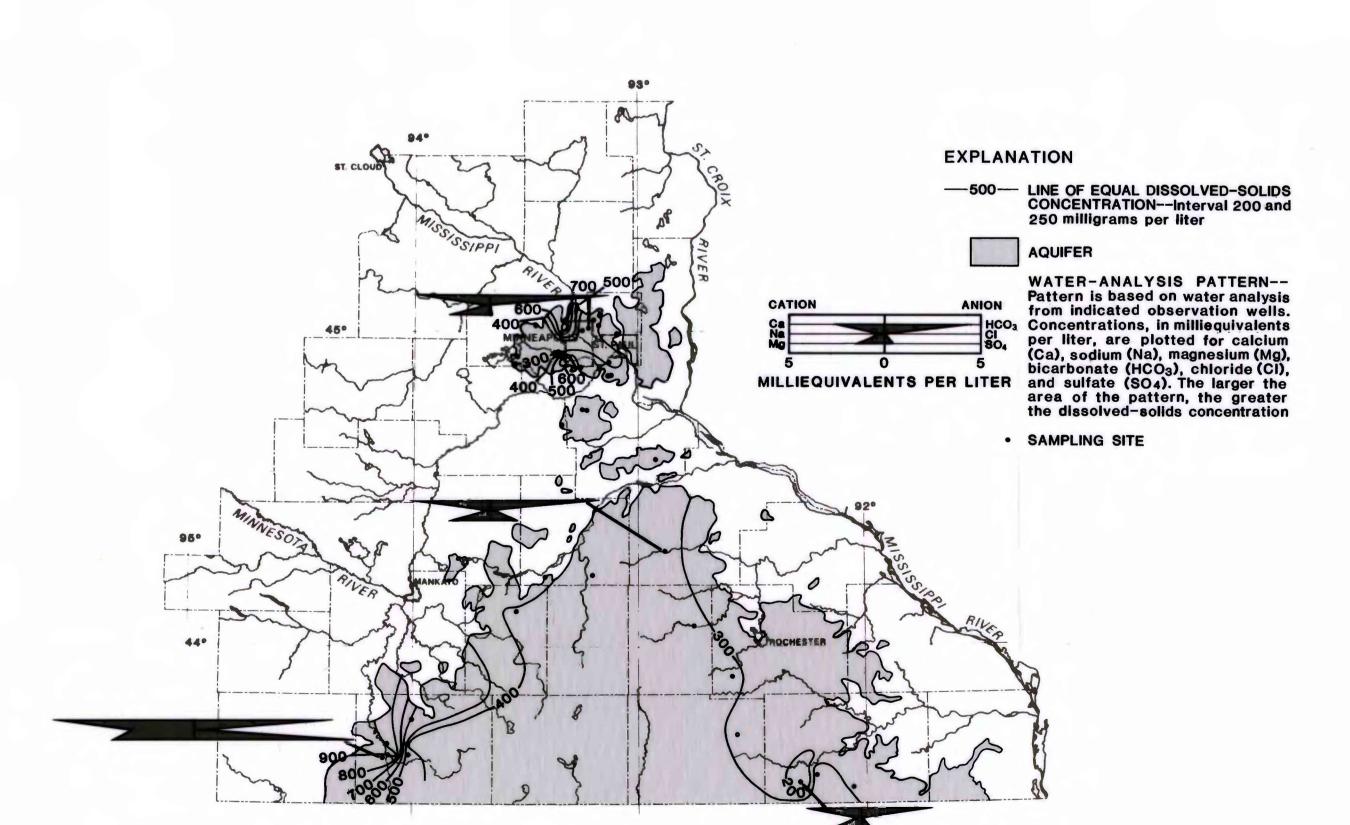


Figure 9.--Dissolved—solids concentration and water—type patterns

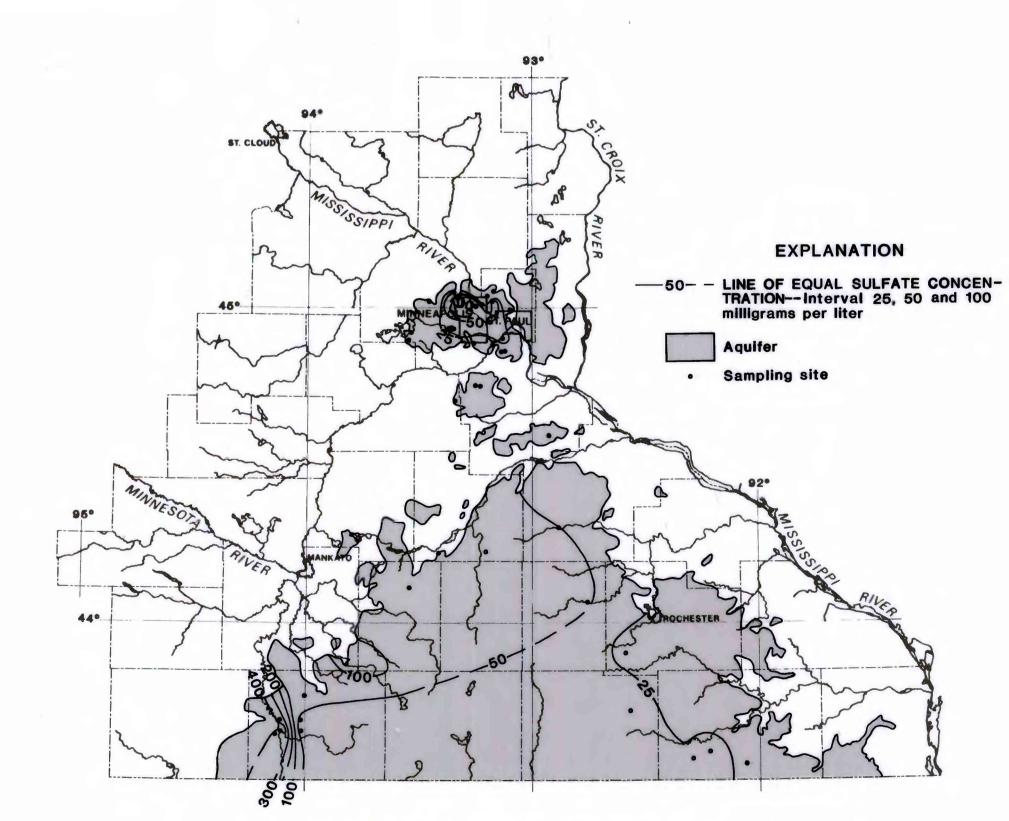


Figure 15.--Sulfate concentration

HYDROGEOLOGIC AND WATER—QUALITY CHARACTERISTICS OF THE ST. PETER AQUIFER, SOUTHEAST MINNESOTA

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State base map, 1:1,000,000, 1965